An emerging pathway of Atlantic Water to the Barents Sea through the Svalbard Archipelago: drivers and variability

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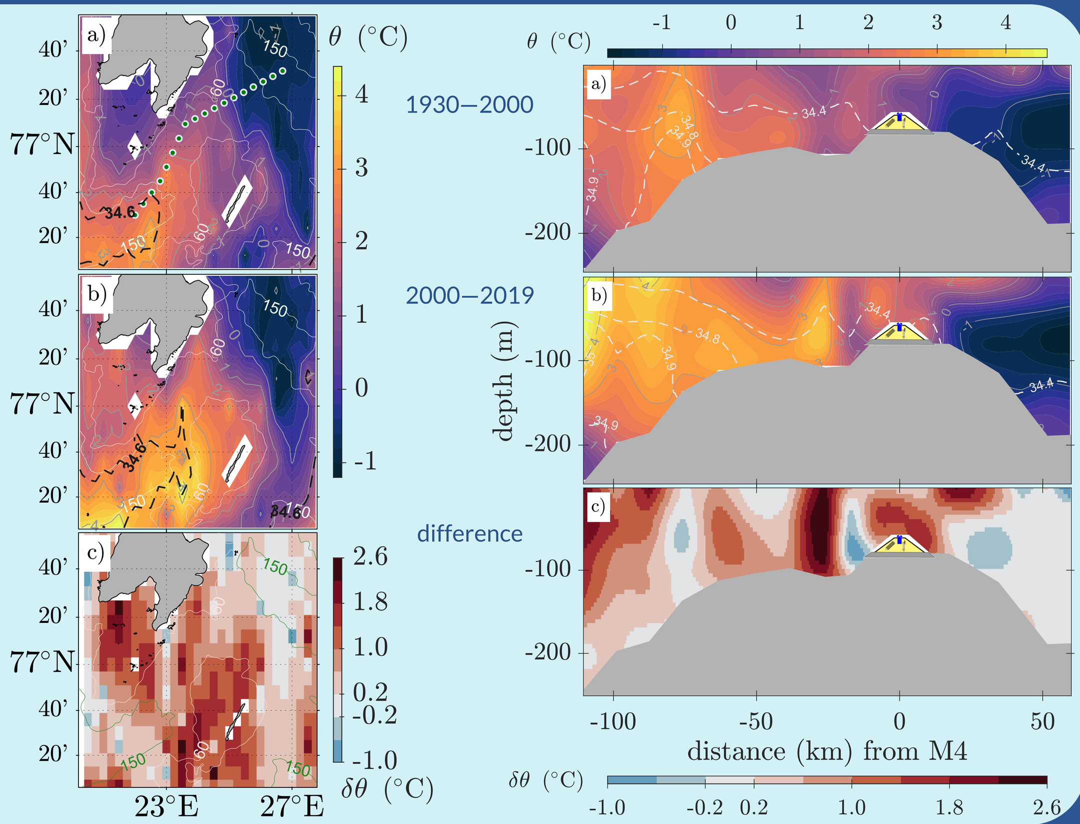
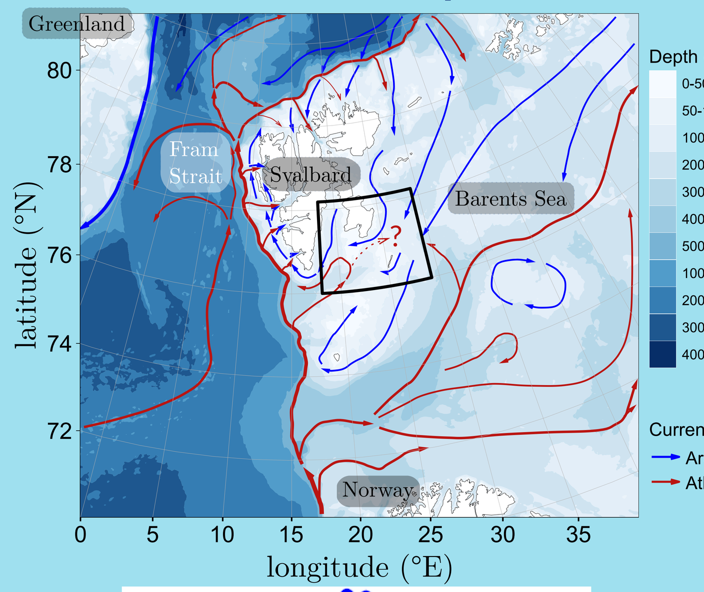
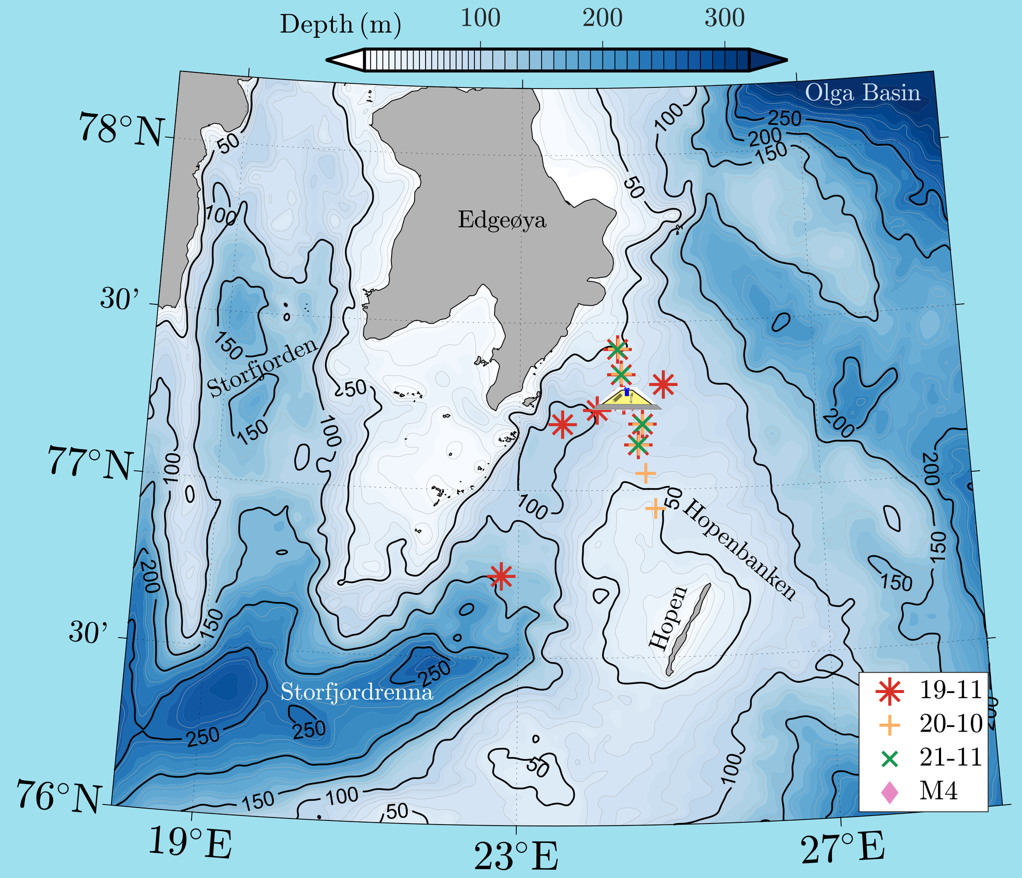
Observed warming in the Barents Sea

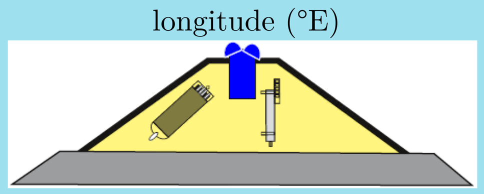
- The trench Storfjordrenna in the Svalbard archipelago has the largest increase in SST in the Barents Sea.
- Climatological hydrographic data show warming through the water column and shoaling of Atlantic Water.
- A shallow saddle separates Storfjordrenna from the Olga Basin – an Arctic domain of the Barents Sea.



Does Atlantic Water cross from Storfjordrenna to Olga Basin via the 70 m deep saddle on Hopenbanken?

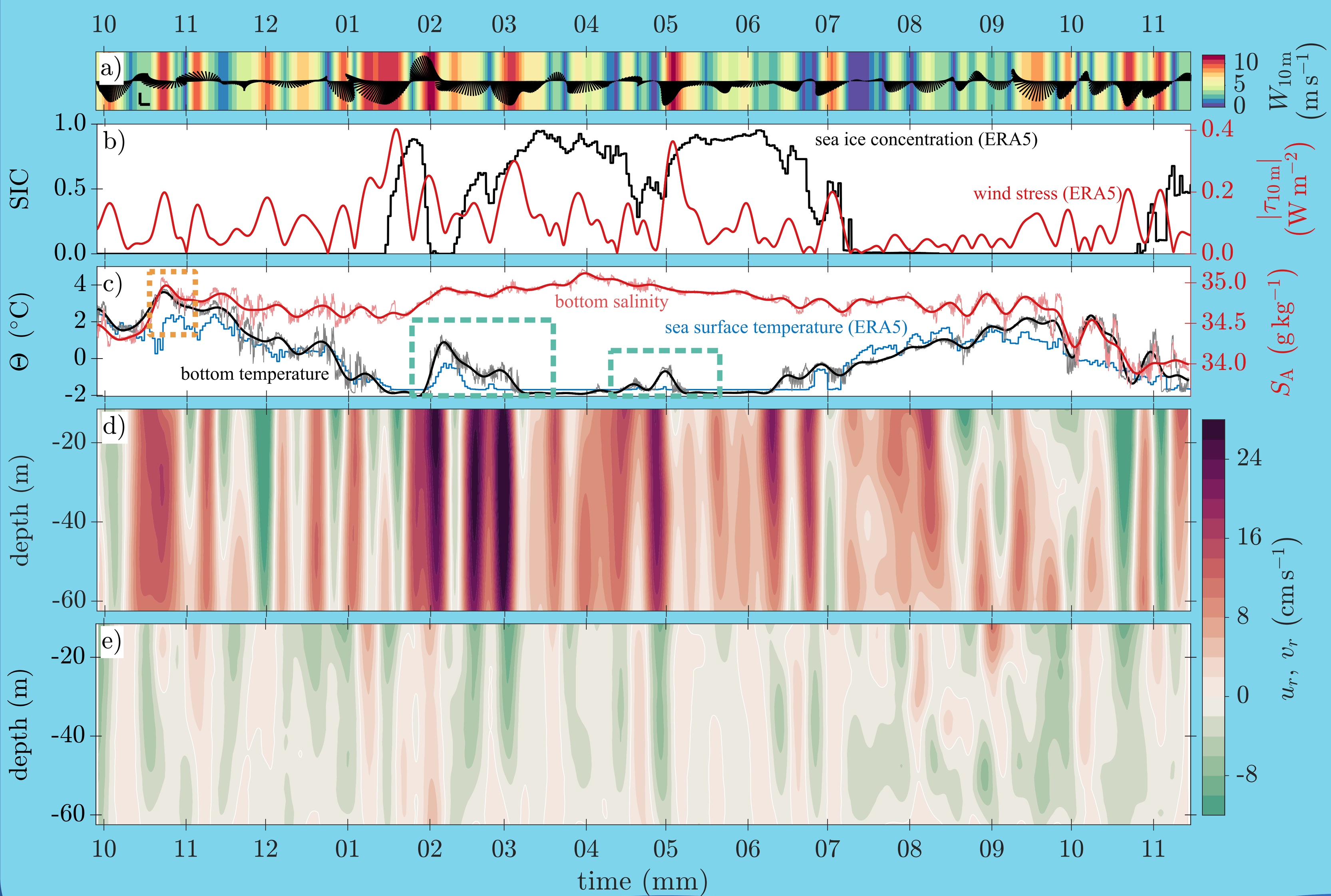




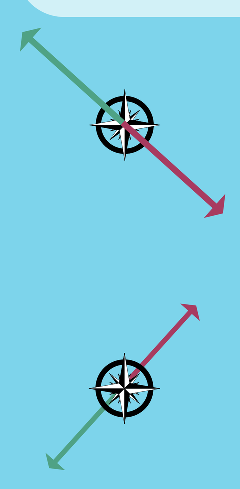


- One year of data from oceanographic mooring:
- Temperature & salinity at bottom
- Current velocity (speed & direction) in water column

Mooring observations and environmental parameters from Sept. 2018 to Nov. 2019

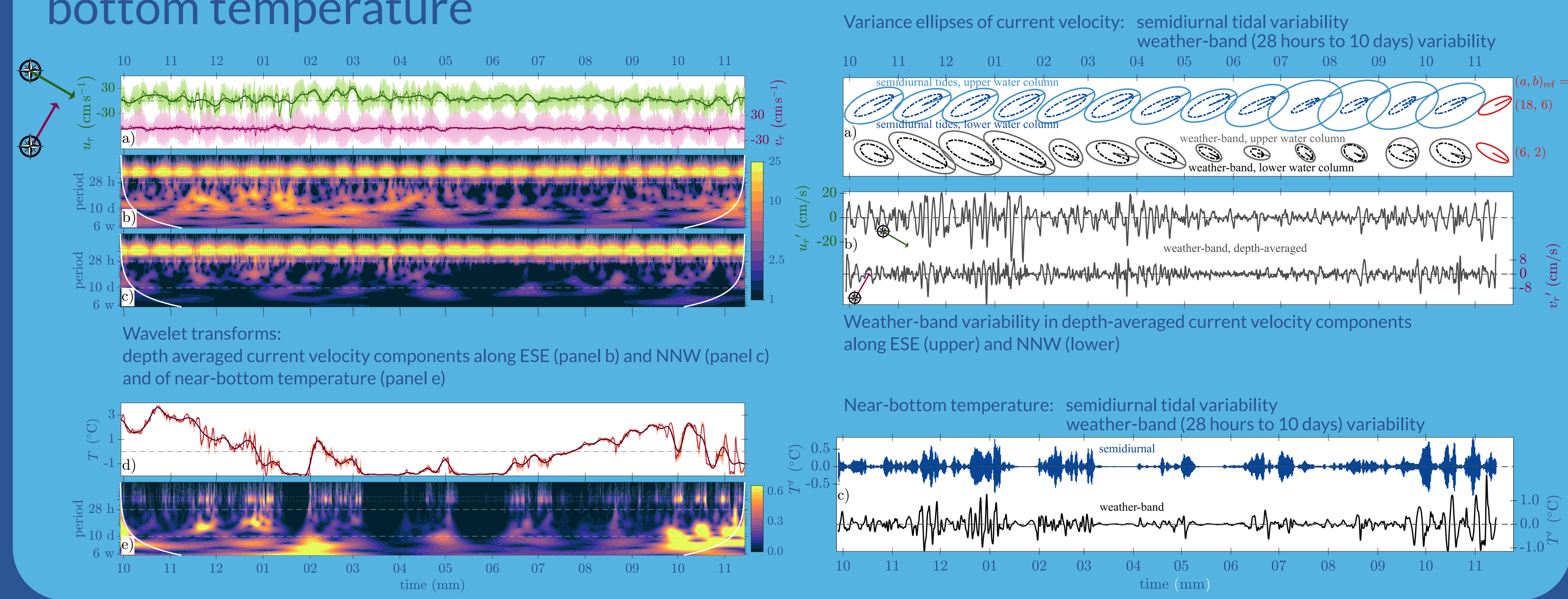


- Modified Atlantic Water reaches the saddle in October 2018.
- Wintertime intrusions of warm water.
- Main flow towards southeast.

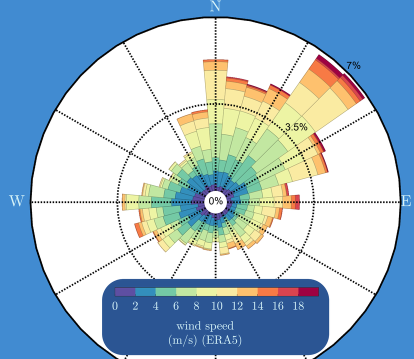


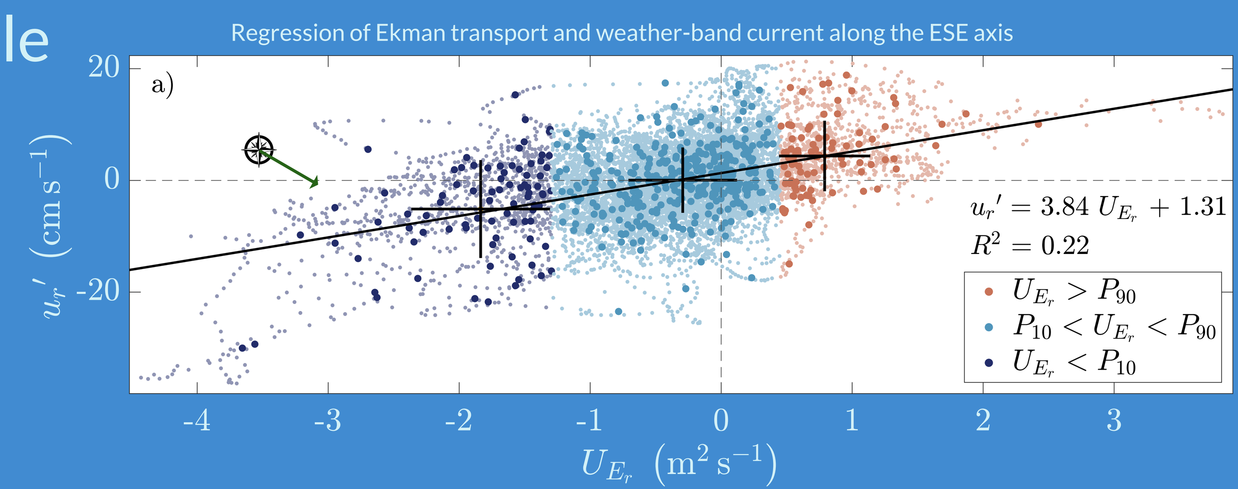
Variability in water column current velocity and near-bottom temperature

- Semidiurnal tides and wind forcing are primary sources of variability.

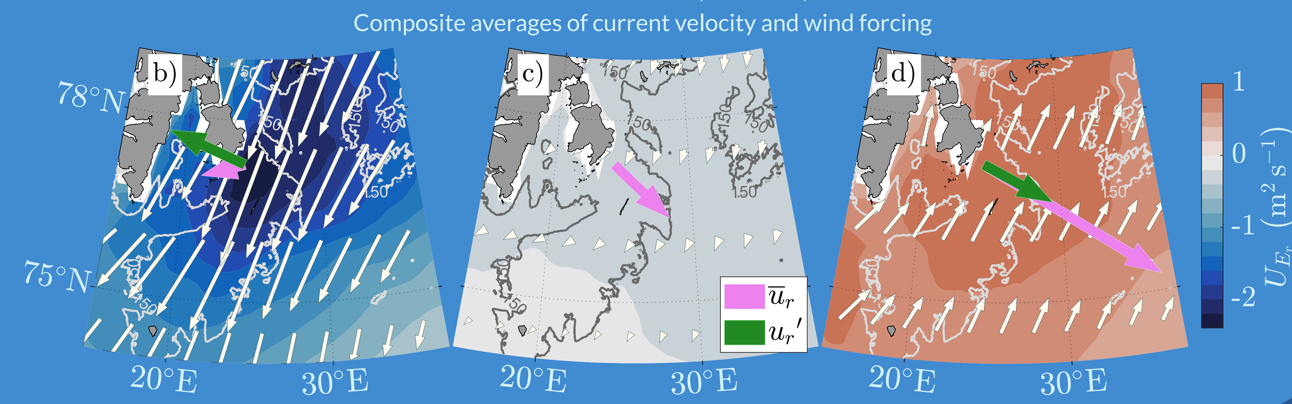


Wind forcing over the saddle

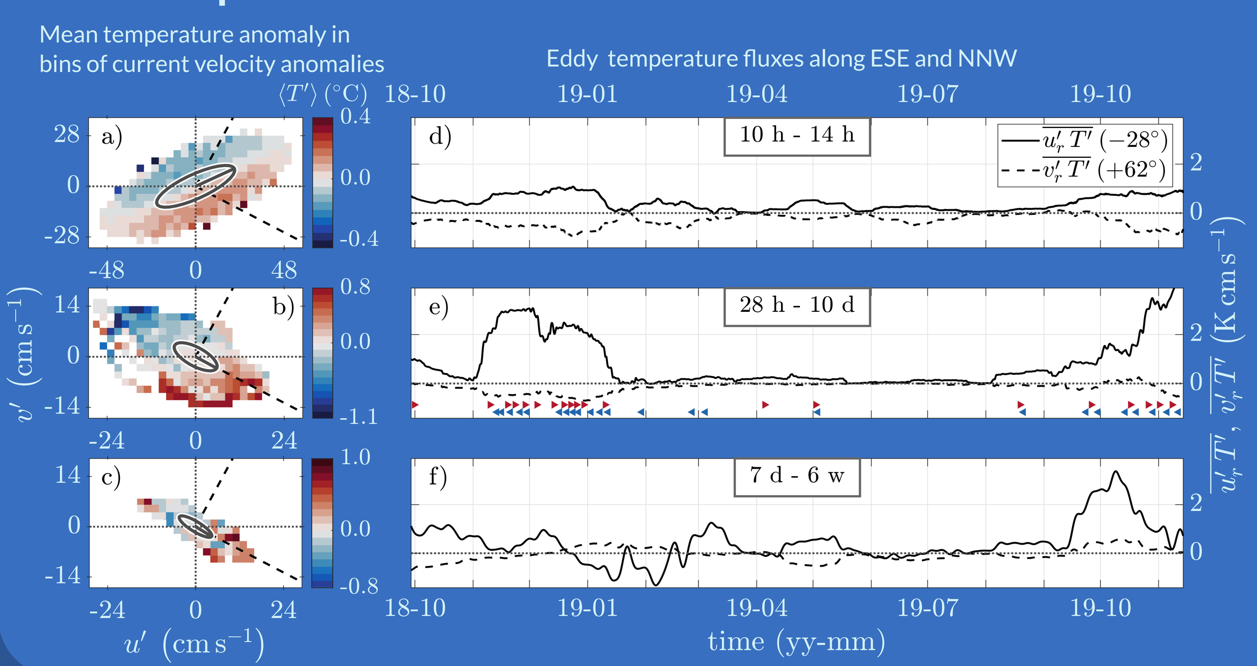


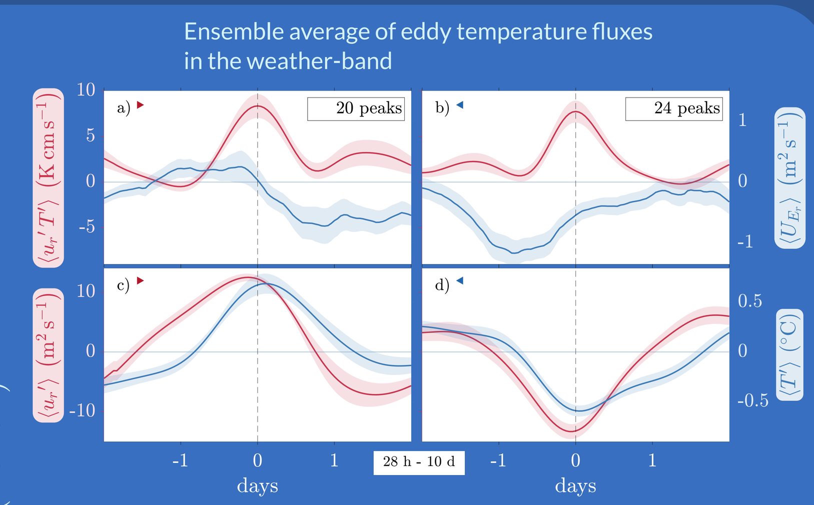


- Predominant north-northeasterly winds oppose the eastward cross-saddle current.
- Strong northwesterly winds reverse the current on the saddle.
- Weaker and/or southerly winds enhance the cross-saddle current.



Across-saddle transport of temperature anomalies





- Semidiurnal tides consistently bring heat of Atlantic origin into the interior of the Barents Sea.
- Weather-band current anomalies contribute significantly during autumn.
- Occasionally, strong current events transport heat across the saddle.

Summary & outlook

Atlantic Water can flow from Storfjordrenna to the saddle on Hopenbanken.

The predominant winds from the northeast oppose the current going into the Barents Sea.

The strong semidiurnal tidal current contributes consistently with heat transfer across the saddle.

Weather-band variability and strong current events also give significant eddy temperature fluxes.

With ongoing Atlantification of the Barents Sea, especially warming and increased dominance of Atlantic Water in Storfjordrenna, and with increasingly meridional winds in the region, we hypothesize that the saddle on Hopenbanken will be an emerging pathway for Atlantic Water and heat into the Barents Sea.